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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/641,379	08/14/2003	Yunbiao Shen	D5437	1247

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EXAMINER
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STEVENS, MAURICE E

ART UNIT	PAPER NUMBER
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2855

DATE MAILED: 09/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/641,379

Applicant(s)

SHEN, YUNBIAO

Examiner

Maurice Stevens

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 8-14-03
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) The invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 7-8, 10-12 and 14-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Itoyama et al (2002/0173898).

In regards to claim 1, 10 and 14, Itoyama et al disclose an apparatus comprising a fuel injector operably connected to a fluid supply system and having a nozzle with a fluid cavity (fig.2, {17 [nozzle of the fuel injector and 19 is the nozzle chamber or fluid cavity of the injector]}), at least one discharge port disposed in the nozzle (fig 2 {at the very bottom of the nozzle of the injector})), an orifice disposed in the nozzle (fig.2 {27}) and a pressure sensor adjacent to the orifice, where in fluid in the fluid cavity is in communication with the pressure sensor, such that the pressure sensor measures fluid pressure (fig. 2 {32 pressure sensor is adjacent to the orifice 27}), a needle slideably mounted inside the fuel injector and the nozzle (paragraph 97 in the description of the preferred embodiment and fig2, {18 [needle]}), a fluid cavity disposed in the nozzle (fig.2, {19 [nozzle chamber=fluid cavity]}) and a pressure sensor in fluid communication with the fluid cavity (fig.2, {32 communicates with 19}), charging a fuel injector with fluid (fig 1, {10 [fuel injection mechanism] comprises a fuel tank [11] and fuel pump [14]}), communicating fluid to a pressure sensor through a first orifice disposed in the nozzle (fig 2, {27 orifice} in [17] the nozzle) and measuring fluid pressure near the at least one discharge port with the pressure sensor (fig 2, {32}).

In regards to claim 2, Itoyama et al disclose wherein the nozzle is mounted to and protrudes into a chamber for the receiving of fluid from the discharge port (fig. 1, {17} is mounted and protrudes

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into a chamber, which is the cylinders and combustion chamber of the engine {1}).

In regards to claim 3, Itoyama et al disclose the apparatus of claim 2, wherein the chamber is a combustion chamber (fig 1, {1 is the engine where the combustion chamber is and the injectors inject their fluid in}). communicating fluid to a pressure sensor through a first orifice disposed in the nozzle (fig 2, {27 orifice} in [17] the nozzle) and measuring fluid pressure near the at least one discharge port with the pressure sensor (fig 2, {32}).

In regards to claim 4, Itoyama et al disclose wherein the chamber is pressurized (fig 1, the combustion chamber in the an engine (1) is pressurized and fig 2, {16 pressure accumulator}).

In regards to claim 5, Itoyama et al disclose the apparatus of claim 4 , further comprising a pressure control valve operably connected to the chamber (fig 1, {56 PCV}).

In regards to claim 7, Itoyama et al disclose the apparatus of claim 1, wherein the fluid supply system comprises a fluid tank and a fuel pump (fig 2, {11 fuel tank and 14 fuel pump}).

In regards to claim 8, Itoyama et al disclose the apparatus of claim 1, further comprising a monitoring device attached to the pressure sensor (fig 2, {41}).

In regards to claim 11, Itoyama et al disclose the apparatus of claim 10 and further comprising an orifice disposed along an outer boundary of the fluid cavity and disposed along an outer boundary of the fluid cavity and disposed in the nozzle, wherein the pressure sensor is disposed in the orifice (fig 2, {the pressure sensor [32] that is disposed in the orifice of the fluid cavity of the fuel injector comprises [16A, 20 ] ).

In regards to claim 12, Itoyama et al disclose the apparatus of claim 10, further comprising an orifice disposed in the needle and disposed along an outer boundary of the fluid cavity, wherein the pressure sensor is disposed in the orifice ((fig 2, {the pressure sensor [32] which is disposed in the orifice of a needle of the fuel injector comprises [16A, 20])).

In regards to claim 15, Itoyama et al disclose Itoyama et al disclose the apparatus of claim 14, further comprising the step of communicating fluid to the pressure sensor through a second orifice in a needle inside the nozzle of the fuel injector (fig 2, {the pressure sensor [32] which comprises 16A which goes down through an orifice in the needle of the fuel injector}).

In regards to claim 16, Itoyama et al disclose the method of claim 14, further comprising the steps of containing the fluid in discharged from the nozzle in a chamber (Fig. 1, {the chamber is the

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combustion chamber of the engine [1] , the fluid is contained there until combustion}}).

In regards to claim 17, Itoyama et al disclose the method of claim 16, further comprising the steps of controlling the operating pressure of the chamber (fig 1, {56 PCV}}).

In regards to claim 18, Itoyama et al disclose the method of claim 16, further comprising the steps of combusting the fluid (fig 1, {1 is an internal combustion engine that has a combustion chamber which is where the fluid is combusted}})

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9, 13 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoyama et al.

In regards to claim 9, 13 and 20, Itoyama et al does not implicitly disclose a piezoelectric Quartz transducer. However the piezoelectric quartz transducer is known, since there is no mention of any specific novelty of this device then the pressure sensor is an equivalent and is deemed to be the transducer mention in the claim (MPEP 2144). At the time the invention was made it would have been obvious to one of ordinary skill in the art to modify Itoyama et al to use any known piezoelectric quartz transducer for sensing the pressure in the fuel line.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which

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said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoyama et al as applied to claims 1-5, 7-18 and 20 above, and further in view of Schmidt et al {Detection of Cavitation in Fuel Injector Nozzles}.

In regards to claim 6 and 19, Itoyama et al does not disclose the apparatus of claim 2, further comprising a flow-metering unit operably connected to the chamber. However, Schmidt et al does disclose a flow-metering unit operably connected to the chamber (fig 3, {Rate of Injection sensor}) and the method of claim 14, further comprising the step of measuring the fluid discharge rate after each discharge of fluid from the nozzle of the injector (fig 3, {Rate of Injection sensor}). It would have been obvious at the time the invention was made to one having an ordinary skill in the art to modify Itoyama et al according to the teachings of Schmidt et al for the purpose of having a fuel rate sensor in a fuel injector to sense how much fuel is being discharged and at what rate the fuel is being discharged when the embodiment was in use.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maurice Stevens whose telephone number is (571) 272-2188. The examiner can normally be reached on M-F, 6:00am-3:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MS/2866  
8-24-04



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